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May 15, 2015

VIA E-MAIL (BLACK.CHRISTOPER@EPA.GOV)
VIA U.S. MAIL

Christopher Black
Project Manager
U.S. EPA, Region 5
77 W. Jackson Blvd. LU-9J
Chicago, IL 60604

Re: *Submittal of the Groundwater Monitoring Work Plan for the Ferro Corporation Facility located at 7050 Krick Road, Walton Hills, Ohio 44146 Docket Number RCRA-05-2011-0020*

Dear Mr. Black:

Ferro Corporation (Ferro) is submitting a copy of the *Groundwater Monitoring Work Plan* for the former Ferro Corporation Facility located at 7050 Krick Road, Walton Hills, Ohio.

If you have any questions regarding the document being submitted herein, please feel free to contact me at 216-875-5781.

Sincerely,

Kelly Wolfe,
Corporate Manager, EHS Manager
Ferro Corporation

cc: Jason Perdion, Baker & Hostetler
Eric Wilburn, Hull & Associates, Inc.

GROUNDWATER MONITORING WORK PLAN

For the:
FORMER FERRO CORPORATION FACILITY
7050 KRICK ROAD
WALTON HILLS, OHIO 44146

Prepared For:
FERRO CORPORATION AND
BAKER & HOSTETLER LLP
1900 EAST 9TH STREET
CLEVELAND, OH 44114

Prepared By:
HULL & ASSOCIATES, INC.
4 HEMISPHERE WAY
BEDFORD, OHIO 44146

MAY 2015

HULL

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1.0 INTRODUCTION

On September 30, 2011, the United States Environmental Protection Agency (U.S. EPA) Region 5 (U.S. EPA) and Ferro Corporation (Ferro) entered into an Administrative Order on Consent (Docket No. RCRA-05-20110-0018) (Consent Order) under Section 3008(h) of the Solid Waste Disposal Act, commonly referred to as RCRA, as amended by the Hazardous and Solid Waste Amendments of 1984 for the Ferro facility located at 7050 Krick Road, Walton Hills, Ohio (Site). The location of the Site is presented on Figure 1 and the Site boundary is presented on Figure 2. The Site was sold to Polymer Additives, Inc., on December 19, 2014. Ferro, however, has retained responsibility for the work required under the Consent Order.

This work plan is being submitted in response to recent U.S. EPA comments on the Environmental Indicators (EI) forms submitted to U.S. EPA during July 2013. Background information and the proposed groundwater monitoring activities are presented herein.

1.1 Background

Consistent with the Consent Order, Ferro submitted a *Corrective Measures Proposal* (CMP) (Hull, 2014) to U.S. EPA in September 2014. The CMP reviewed remedial alternatives for the Site in order to mitigate any potential existing and future unacceptable risks posed to human health and the environment at or from the Site. The CMP corrective measure alternatives reflected the conclusions of the EI forms submitted to U.S. EPA in July 2013. Specifically, the EI forms indicated that 'migration of contaminated groundwater' and 'current human exposures' are 'under control' at the Site.[1] However, current human exposures are under control with the implementation of institutional controls that restrict the Site to commercial/industrial land use and preclude the extraction of groundwater from beneath the Site for potable purposes as well as implementation of risk mitigation measures to protect construction/excavation workers who may be involved in intrusive activities at the Site. Therefore, the recommended CMP corrective measure alternative reflected the institutional controls and risk mitigation measures necessary in order to maintain 'control' at the Site.

Shortly following submittal of the CMP to U.S. EPA, the U.S. EPA issued their EI forms for the Site. Specifically, U.S. EPA concluded that 'migration of contaminated groundwater' and 'current human exposures' are 'under control' at the Site, however, the Agency requested groundwater monitoring in the vicinity of the unnamed tributary in the northwest portion of the Site in order to verify that migration of chlorinated compounds observed in groundwater in this area are under control. The CMP was submitted prior to receipt of U.S. EPA's EI forms and therefore does not reflect a groundwater monitoring program.

[1] Terminology as reflected within the Documentation of Environmental Indicator Determination (EI) forms.

1.2 Groundwater Investigation

As indicated in the *Summary and Assessment of Baseline and Delineation Investigation Activities* (Summary Report) (Hull, 2013) and EI forms for the Site, concentrations of chlorinated compounds were observed within the northwest portion of the Site, west of Solid Waste Management Unit (SWMU) 14. Specifically, as presented on Figure 3, the highest concentrations of chlorinated compounds were detected in monitoring well HMW-3; these chlorinated compounds consist of tetrachloroethene as well as the associated daughter products trichloroethene, trans-1,2-dichloroethene, cis-1,2-dichloroethene and vinyl chloride. A reduction in both the number of detected chlorinated compounds as well as the concentration levels are observed in immediately surrounding monitoring wells. A comprehensive review of potential on-Site sources as well as the spatial distribution of the chlorinated compounds across all environmental media on a Site-wide basis is presented in the Summary Report and summarized in the EI forms. Based on this review, it was determined that due to the lack of a source for the elevated chlorinated compounds, coupled with the spatial distribution of the chlorinated compounds, particularly the absence of chlorinated compounds exceeding applicable standards in any environmental media at the remaining portion of the Site, the data supports a finding that the chlorinated compounds observed in groundwater at the Site are not attributed to historical or current Ferro operations. Rather, the possible source of the elevated chlorinated concentrations is a former outfall pipe originating from the adjacent property owner, Bedford Anodizing, which may have discharged in the vicinity of monitoring well HMW-3 thus explaining the presence of chlorinated compounds observed in this area.

1.3 Purpose of Groundwater Monitoring

The objective of the groundwater monitoring program is to verify that 'migration of contaminated groundwater,' specifically chlorinated compounds observed in groundwater within the northwest portion of the Site as discussed above, is 'under control.'

2.0 GROUNDWATER MONITORING SAMPLING ACTIVITIES AND PROTOCOLS

The groundwater monitoring program, including the monitoring well network, analyses, frequency and schedule, are described below.

2.1 Groundwater Monitoring Network

Groundwater samples will be collected from a total of six existing monitoring wells at the Site:

- HMW-3, the location of the highest concentrations of chlorinated compounds observed in on-Site groundwater;
- Up-gradient monitoring wells HMW-10 and HMW-11; and
- Up-gradient/side-gradient monitoring wells HMW-4, HMW-12 and HMW-13.

2.2 Targeted Analyte List

Groundwater samples, including applicable quality assurance/quality control samples, will be submitted for laboratory analysis of the parent and daughter products associated with the degredation of tetrachloroethene. This includes laboratory analysis of:

- tetrachloroethene,
- trichloroethene,
- cis-1,2-dichloroethene,
- trans-1,2-dichloroethene; and
- vinyl chloride.

2.3 Groundwater Sampling Frequency

Groundwater samples will be collected on a semi-annual basis for a total of six groundwater sampling events which will supplement the existing groundwater analytical dataset. The semi-annual groundwater samples will be collected during the Summer and Winter seasons in order to assess extreme temporal variations (i.e., dry/wet seasons). A tabulated summary of the groundwater sampling frequency is presented in Table 1.

2.4 Water Level Measurements

Depth to water measurements will be collected during each regularly scheduled semi-annual sampling event. The water levels will be collected to assess any significant changes in the direction of groundwater flow in this portion of the Site during the monitoring period.

2.5 Sampling and Analysis Protocols

2.5.1 Groundwater Sampling Procedures

Groundwater samples will be collected in accordance with the sampling procedures described within the Field Sampling and Analysis Plan (FSAP) (Hull, 2012). Specifically, groundwater monitoring wells will be purged prior to sampling; and groundwater samples will be collected utilizing either dedicated bailers or preferably, low-flow sampling methodology. Pertinent information regarding the groundwater purging and sampling techniques will be recorded for anticipated future submittal.

2.5.2 Laboratory Analysis

Groundwater samples will be analyzed in accordance with the analytical methods included within the FSAP. Specifically, groundwater samples proposed as part of this work plan will be submitted for laboratory analysis of select VOCs. Thus, U.S. EPA Analytical Method 8260B will be utilized for laboratory analysis of groundwater samples.

Groundwater samples will be submitted to ESC Lab Sciences (ESC) in Mt. Juliet, Tennessee for the duration of the monitoring program described herein. Any deviations from the primary laboratory identified herein will be documented in the applicable quarterly report submitted to U.S. EPA in accordance with the Consent Order.

3.0 QUALITY ASSURANCE AND QUALITY CONTROL

3.1 QA/QC Criteria

Quality assurance/quality control (QA/QC) procedures for field sampling and laboratory analysis are described within the *Quality Assurance Project Plan* (for U.S. EPA Region V) (QAPP) (Hull, 2012). Refer to the QAPP for a detailed discussion regarding specific QA/QC procedures that ensure the integrity of field samples and laboratory generated analytical data.

3.2 Groundwater Data Review Process

All analytical data generated throughout the course of the groundwater monitoring program proposed herein will be reviewed to ensure that the data quality meets the overall objective of the sampling program. This review will consist of utilizing Ohio EPA's Tier I Checklist (Version 4.0, February 19, 2008) to determine whether the analytical data meets acceptable data quality objectives.

4.0 TERMINATION CRITERIA AND REPORTING

4.1 Termination Criteria

Termination criteria for the groundwater monitoring program is contingent upon the groundwater analytical results obtained during the semi-annual sampling events. At the end of the monitoring period (*i.e.*, six semi-annual groundwater sampling events), analytical data collected during the monitoring period will be reviewed to determine the groundwater plume's stability. An evaluation of the groundwater plume's stability is anticipated to include a review of spatial distribution of chlorinated compounds observed in the monitoring well network proposed herein as well as a review of any potential trends observed in both the number of chemicals detected and corresponding concentrations over time. Following the analytical data review, a recommendation will be made for either: (1) termination of the monitoring program; (2) continuation of the existing monitoring program; or (3) modification of the existing monitoring program.

4.2 Reporting

A summary report including a tabulated summary of the analytical data obtained from the semi-annual groundwater sampling events as well as a summary of the plume stability findings along with recommendations for either the termination, extension and/or modification of the groundwater monitoring program will be prepared and submitted to U.S. EPA following the conclusion of the monitoring period. Note that if in the interim groundwater analytical data suggests that 'migration of contaminated groundwater' is not 'under control,' U.S. EPA will be promptly notified.

The initial semi-annual groundwater sampling event will be conducted during Winter 2015 with the final semi-annual groundwater event expected to be completed during Winter 2018. Semi-annual sampling activities will be documented within the quarterly activities reports submitted to U.S. EPA on a quarterly basis in accordance with the Consent Order.

5.0 REFERENCES

Hull & Associates, Inc. *Quality Assurance Project Plan for the Ferro Corporation Facility.* April 2012.

Hull & Associates, Inc. *Field Sampling and Analysis Plan for the Ferro Corporation Facility.* May 2012.

Hull & Associates, Inc. *Summary and Assessment of Baseline and Delineation Investigation Activities for the Ferro Corporation Facility.* July 2013.

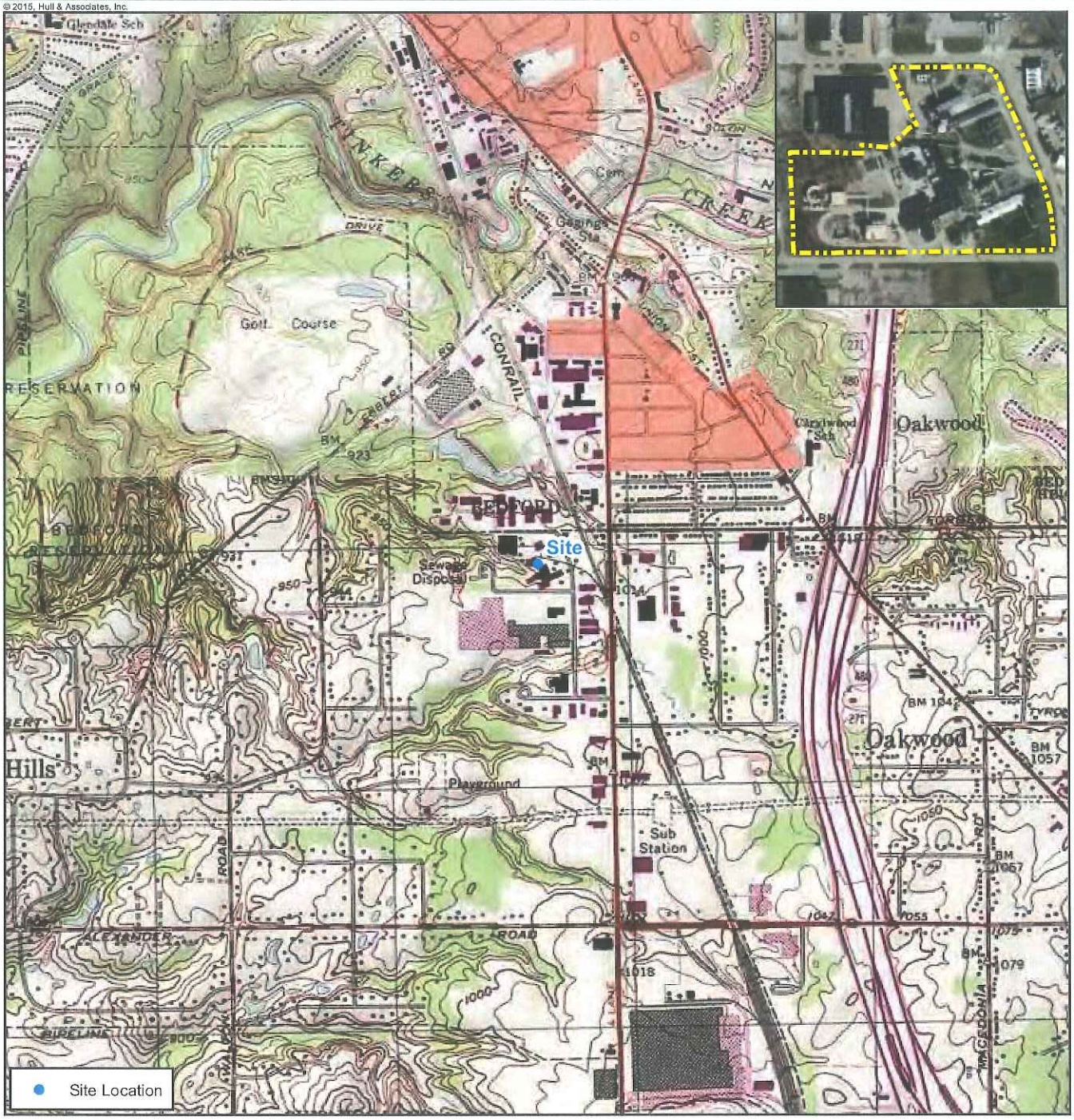
Hull & Associates, Inc. *Documentation of Environmental Indicator Determination, Current Human Exposures Under Control (CA 725).* Ferro Corporation; OHD004161410.

Hull & Associates, Inc. *Documentation of Environmental Indicator Determination, Migration of Contaminated Groundwater Under Control (CA 750).* Ferro Corporation; OHD00416140.

Hull & Associates, Inc. *Corrective Measures Proposal for the Ferro Corporation Facility.* September 2014.

Ohio Environmental Protection Agency. *Tier I Checklist, Version 4.0.* February 19, 2008.

FIGURES



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0 500 1,000 2,000 Feet

1:24,000

Quad: Northfield

Source: The topographic map was acquired through the USGS Topographic Map web service.

The aerial photo in the inset was acquired through the ESRI Imagery web service. Aerial photography dated 2012.

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Groundwater Monitoring Work Plan
Ferro Corporation

Site Location Map

7050 Krick Road
Walton Hills, Cuyahoga County, Ohio

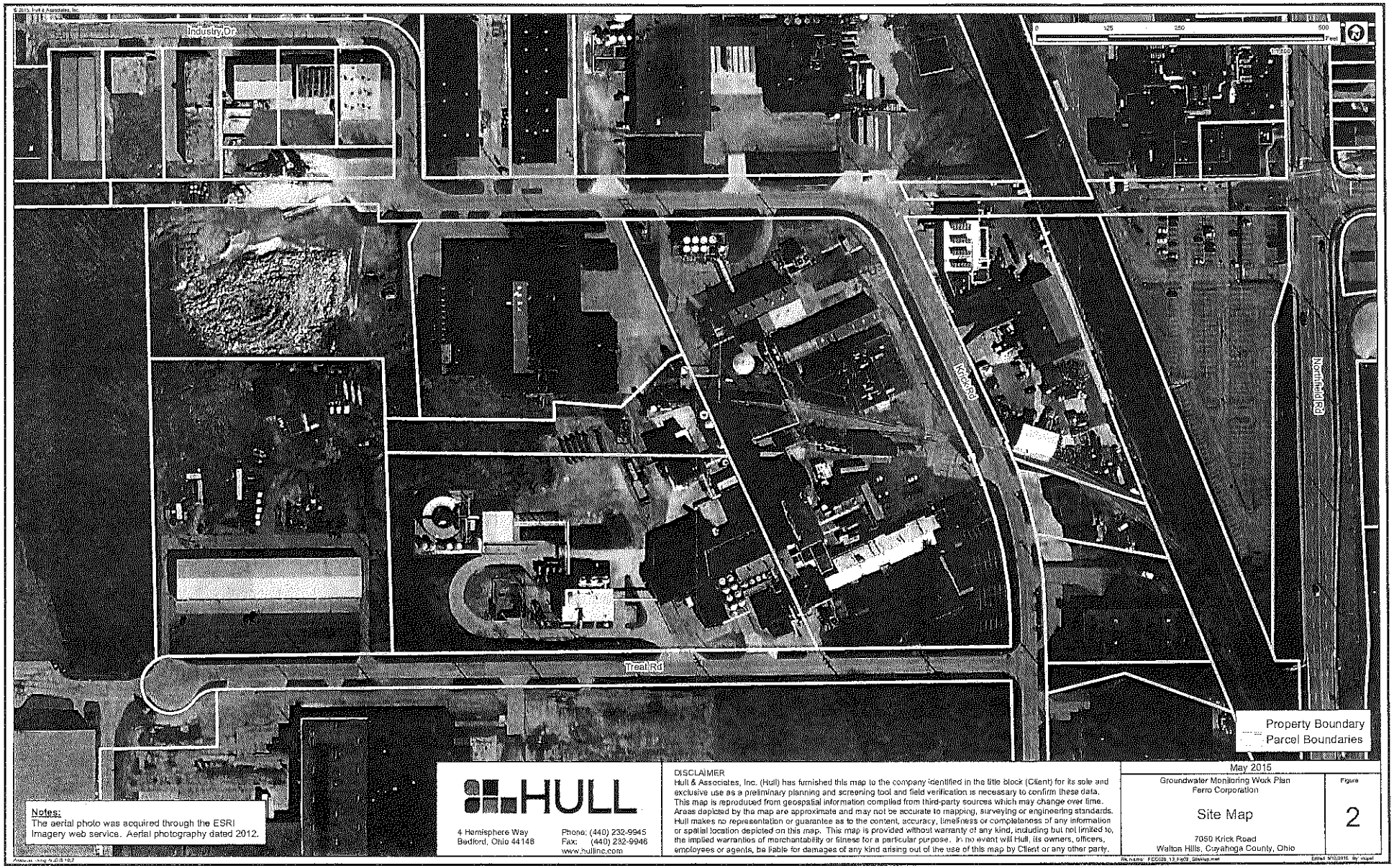
Date:
May 2015

File Name:
FCO028_13_Fig01_SLM.mxd

Edited: 5/12/2015 By: mopel

Figure
1

Produced using ArcGIS 10.2



Notes:
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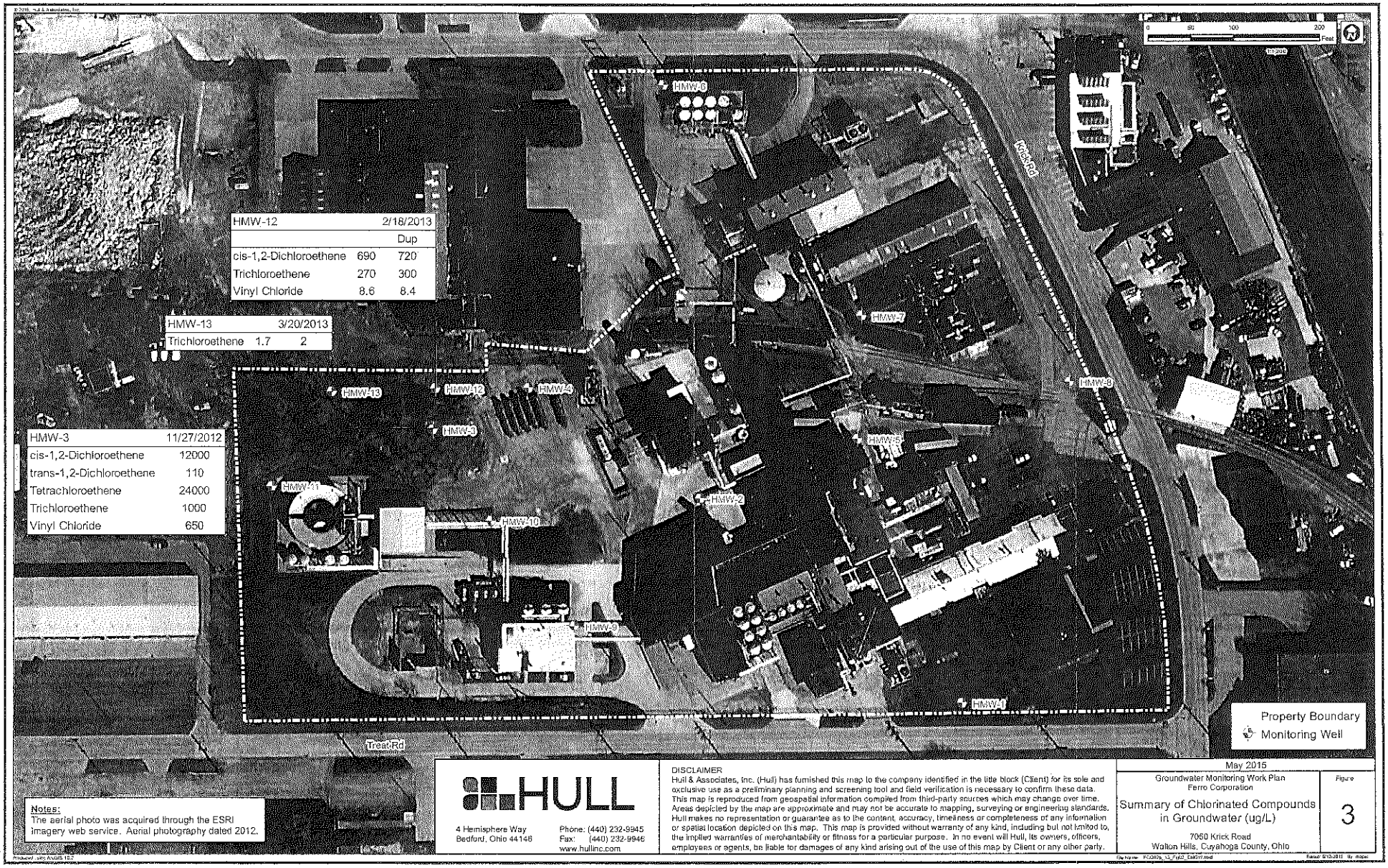
Groundwater Monitoring Work Plan
Ferro Corporation

Site Map

7050 Krick Road
Walton Hills, Cuyahoga County, Ohio

Figure 2



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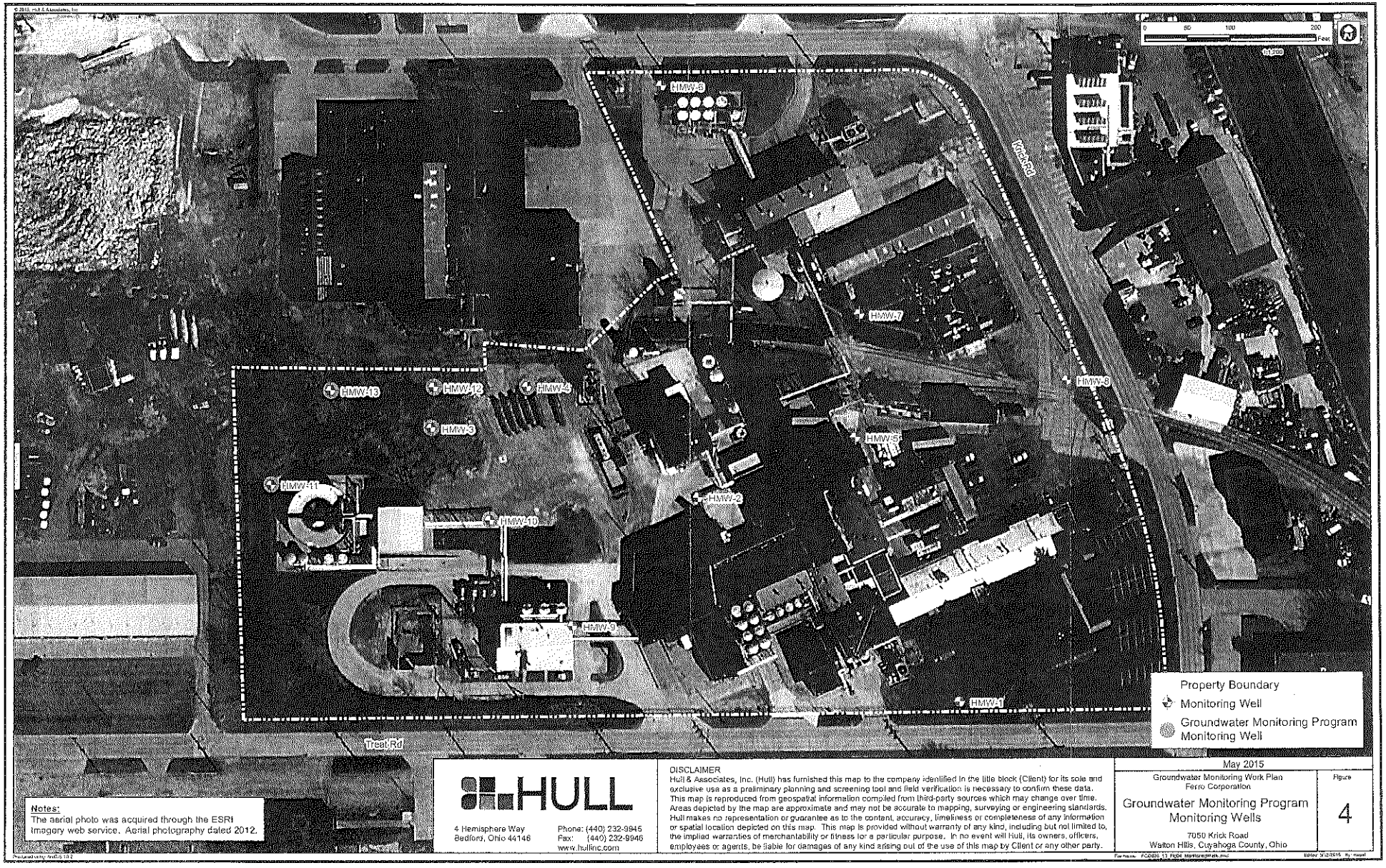
Groundwater Monitoring Work Plan
Ferro Corporation

Summary of Chlorinated Compounds in Groundwater (ug/L)

7060 Krick Road
Walton Hills, Cuyahoga County, Ohio

Figure 3



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Groundwater Monitoring Work Plan
Ferro Corporation

Groundwater Monitoring Program Monitoring Wells

7050 Krick Road
Walton Hills, Cuyahoga County, Ohio

Figure 4

TABLE

GROUNDWATER MONITORING WORK PLAN
FERRO CORPORATION
7050 KRICK ROAD, WALTON HILLS, OHIO

TABLE 1

SAMPLE FREQUENCY SUMMARY[1]

Sample Location	Laboratory Parameters				
	Tetrachloroethene	Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Vinyl Chloride
GROUNDWATER FIELD SAMPLES					
HMW-3	1	1	1	1	1
HMW-4	1	1	1	1	1
HMW-10	1	1	1	1	1
HMW-11	1	1	1	1	1
HMW-12	1	1	1	1	1
HMW-13	1	1	1	1	1
FIELD SAMPLE TOTAL	**6**	**6**	**6**	**6**	**6**
QA/QC SAMPLES					
Field Duplicate	1	1	1	1	1
Equipment Blank	1	1	1	1	1
Matrix Spike/Matrix Spike Duplicate	1	1	1	1	1
Trip Blank	1	1	1	1	1
QA/QC SAMPLE TOTAL	**4**	**4**	**4**	**4**	**4**
GRAND TOTAL	**10**	**10**	**10**	**10**	**10**

Notes:

1. Groundwater sampling frequency for each individual semi-annual groundwater sampling event.